

Memorandum



Date: July 10, 2007

Agenda Item No. 8(R)(1)(G)

To: Honorable Chairman Bruno A. Barreiro and
Members, Board of County Commissioners

From: George M. Burgess
County Manager

A handwritten signature in black ink, appearing to read "G. Burgess", written over the printed name of the County Manager.

Subject: Joint Funding Agreement with the United States Geological Survey to conduct microbial and geochemical investigations of the Floridan and Biscayne Aquifers

RECOMMENDATION

It is recommended that the Board of County Commissioners (Board) adopt the attached resolution approving a Joint Funding Agreement between Miami-Dade County and the U.S. Geological Survey (USGS) to conduct microbial and geochemical studies of the Floridan and Biscayne Aquifers. The Miami-Dade Water and Sewer Department (MDWASD) is proposing this project as an in-kind service project in lieu of making a cash payment to the Florida Department of Environmental Protection (FDEP) in settlement of the issues addressed in Consent Order No. 04-1783. The consent order was entered into between Miami-Dade County and the FDEP on June 20, 2006 pursuant to Resolution R-774-06. It relates to the unauthorized use of two (2) of the County's aquifer storage and recovery (ASR) wells in the Southwest Wellfield.

SCOPE OF AGENDA ITEM

The impact of this agenda item is county-wide as it will benefit the use of the Floridan Aquifer as an alternative water supply for Miami-Dade County, and it will comply with the In-Kind Services Option cited in Paragraph 11 of FDEP Consent Order No. 04-1783.

FISCAL IMPACT/FUNDING SOURCE

The fiscal impact of this agenda item is \$370,650 which will be funded by MDWASD. The funding source is operating revenues.

TRACK RECORD/MONITOR

The USGS is a federal agency that is regarded as the national expert in the field of microbial and geochemical studies.

BACKGROUND

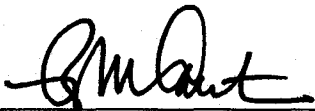
MDWASD operates three regional water treatment plants which currently treat approximately 347 million gallons per day. MDWASD constructed three ASR wells in the West Wellfield and two in Southwest Wellfield. The wells have the capacity to store 25 million gallons of raw fresh water per day from the Biscayne Aquifer in the Floridan Aquifer during the wet season and to recover the stored water during the dry season, when the Biscayne aquifer is stressed. These wells are part of MDWASD's alternative water supply strategy.

The ASR wells are regulated under the FDEP Underground Injection Control Program and are classified as Class V, which requires that the water being injected meet primary drinking water standards prior to injection. Furthermore, FDEP authorization is required prior to injection, under "Operational Testing Approval", thereafter, MDWASD needs to get an operation permit, which has to be renewed every 5 years.

The construction of the wells in the Southwest Wellfield was, for the most part, completed in 1999. Litigation with the Contractor which was resolved in 2001 with a settlement of \$570,000 kept MDWASD from operating the wells for over two years, consequently, many of the critical components became inoperable. In January 2002, MDWASD operated ASR wells, ASR 1-SW and ASR-2-SW, in injection mode, for approximately 25 days to determine the condition of the equipment. Prior to injecting water into the wells, the source water was tested to ensure water quality was met. However, MDWASD did not notify FDEP of the testing. One month later, during a routine compliance inspection conducted by FDEP, FDEP noted that the wells had been operated without authorization. On March 15, 2002, FDEP issued a "Notice of Non-Compliance" to MDWASD alleging that 1) the ASR wells were operated without written authorization, 2) the background water quality analysis and operation and maintenance manuals were not submitted to FDEP prior to operation testing, and 3) construction of the monitoring well was not completed. Meanwhile, MDWASD entered into Consent Order No. 04-1783 and negotiated a settlement with FDEP which included the design and construction of the monitoring well. At this time, MDWASD has completed FDEP's requirements for operational testing and the construction of a monitoring well into the Floridan Aquifer.

As a result of the terms of Consent Order No. 04-1783, MDWASD is proposing to implement an in-kind project in lieu of paying cash for the penalties and FDEP has approved the project. MDWASD's commitment to do the in-kind project settles Consent Order No. 04-1783. The implementation of the in-kind project is subject to meeting a completion schedule and to quarterly reporting.

The in-kind project consists of completing one environmental enhancement study as proposed by the USGS which will address microbial and geochemical changes to the potable drinking water supply in Miami-Dade County as a result of use of the Floridan Aquifer as an alternative water supply, including blending, aquifer storage and recovery and ultra-violet disinfection. The main purpose of the proposed in-kind project is to study the survival and persistence of bacteria and pathogens in the Floridan Aquifer and characterization of the aquifer solid material using digital borehole imaging technology developed by the USGS.



Assistant County Manager

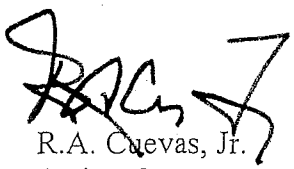


MEMORANDUM

(Revised)

TO: Honorable Chairman Bruno A. Barreiro
and Members, Board of County Commissioners

DATE: July 10, 2007

FROM: 
R.A. Cuevas, Jr.
Acting County Attorney

SUBJECT: Agenda Item No. 8(R)(1)(G)

Please note any items checked.

_____ "4-Day Rule" ("3-Day Rule" for committees) applicable if raised

_____ 6 weeks required between first reading and public hearing

_____ 4 weeks notification to municipal officials required prior to public hearing

_____ Decreases revenues or increases expenditures without balancing budget

_____ Budget required

_____ Statement of fiscal impact required

_____ Bid waiver requiring County Manager's written recommendation

_____ Ordinance creating a new board requires detailed County Manager's report for public hearing

_____ Housekeeping item (no policy decision required)

_____ No committee review

Approved _____ Mayor
Veto _____
Override _____

Agenda Item No. 8(R)(1)(G)
07-10-07

RESOLUTION NO. _____

RESOLUTION APPROVING A JOINT FUNDING
AGREEMENT BETWEEN MIAMI-DADE COUNTY AND U.S.
GEOLOGICAL SURVEY ("USGS") TO CONDUCT A
MICROBIAL AND GEOCHEMICAL STUDY OF THE
FLORIDAN AND BISCAYNE AQUIFERS IN MIAMI-DADE
COUNTY

WHEREAS, this Board desires to accomplish the purposes outlined in the
accompanying memorandum, a copy of which is incorporated herein by reference,

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY
COMMISSIONERS OF MIAMI-DADE COUNTY, FLORIDA, that the County Mayor or his
designee is hereby authorized, for and on behalf of Miami-Dade County, to execute the
Joint Funding Agreement between Miami-Dade County and the USGS, in substantially the
form attached hereto, and to exercise the provisions thereof.

The foregoing resolution was offered by Commissioner
who moved its adoption. The motion was seconded by Commissioner
and upon being put to a vote, the vote was as follows:

Bruno A. Barreiro, Chairperson	
Barbara J. Jordan, Vice-Chairperson	
Jose "Pepe" Diaz	Audrey M. Edmonson
Carlos A. Gimenez	Sally A. Heyman
Joe A. Martinez	Dennis C. Moss
Dorrin D. Rolle	Natacha Seijas
Katy Sorenson	Rebeca Sosa
Sen. Javier D. Souto	

The Chairperson thereupon declared the resolution duly passed and adopted this 10th day of July, 2007. This resolution shall become effective ten (10) days after the date of its adoption unless vetoed by the Mayor, and if vetoed, shall become effective only upon an override by this Board.

MIAMI-DADE COUNTY, FLORIDA
BY ITS BOARD OF COUNTY
COMMISSIONERS

HARVEY RUVIN, CLERK

By: _____
Deputy Clerk

Approved by County Attorney as
to form and legal sufficiency: 

David M. Murray

5

Form 9-1366
(Oct. 2005)

**U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement**

Customer #: FL016
Agreement #: 07E0FL208016
Project #: 7-2080-D0Z00
TIN #: 59-6000573
Fixed Cost Agreement ☒ Yes ☐ No

Page 1 of 2

**FOR
WATER RESOURCES INVESTIGATION**

THIS AGREEMENT is entered into as of the 01 day of August, 2007, by the U.S. GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the MIAMI-DADE COUNTY WATER AND SEWER DEPARTMENT, party of the second part.

1. The parties hereto agree that subject to availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation MICROBIAL AND GEOCHEMICAL INVESTIGATIONS OF THE INFLUENCE OF DISSOLVED ORGANIC CARBON ON THE MICROBIAL ECOLOGY OF NATIVE AND BLENDED WATERS FROM THE FLORIDAN AND BISCAYNE AQUIFERS, herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50; and 43 USC 50b.
2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) includes In-Kind Services in the amount of \$0.00.

(a) \$0.00 by the party of the first part during the period
August 01, 2007 to July 31, 2009

(b) \$370,650.00 by the party of the second part during the period
August 01, 2007 to July 31, 2009

(c) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.

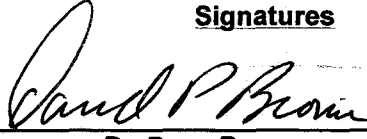
(d) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.
4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.
5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.
6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.
7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.

6

Form 9-1366
continuedU.S. Department of the Interior
U.S. Geological Survey
Joint Funding AgreementCustomer #: FL016
Agreement #: 07E0FL208016
Project #: 7-2080-D0Z00
TIN #: 59-6000573

8. The maps, records, or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records, or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program and, if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at costs, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records, or reports published by either party shall contain a statement of the cooperative relations between the parties.
9. USGS will issue billings utilizing Department of the Interior Bill for Collection (form DI-1040). Billing documents are to be rendered **QUARTERLY**. Payments of bills are due within 60 days after the billing date. If not paid by the due date, interest will be charged at the current Treasury rate for each 30 day period, or portion thereof, that the payment is delayed beyond the due date. (31 USC 3717; Comptroller General File B-212222, August 23, 1983).

U.S. Geological Survey
United States
Department of the InteriorMIAMI-DADE COUNTY WATER AND SEWER
DEPARTMENTUSGS Point of ContactName: Jean Happel, A.O.
Address: 3110 S.W. 9th Avenue
Ft. Lauderdale, FL 33315
DUNS # 137784026
Telephone: 954/377-5932
Email: jhappel@usgs.govCustomer Point of ContactName: Virginia Walsh, P.G.
Address: 3071 S.W. 38th Avenue
Room 554-10
Miami, FL 33146
Telephone: 786/552-8266
Email: WALSH@miamidade.govSignaturesBy  Date 5/10/07
Name: Dr. Barry Rosen
Title: Acting FISC DirectorSignaturesBy _____ Date _____
Name: _____
Title: _____By _____ Date _____
Name: _____
Title: _____By _____ Date _____
Name: _____
Title: _____By _____ Date _____
Name: _____
Title: _____By  Date _____
Name: _____
Title: _____

7

Microbial and Geochemical Investigations of the Influence of Dissolved Organic Carbon on the Microbial Ecology of Native and Blended Waters from the Floridan and Biscayne Aquifers

Submitted by:

John T. Lisle, PhD

USGS Center for Watershed & Coastal Studies
St. Petersburg, FL

Ron W. Harvey, PhD

USGS National Research Program
Boulder, CO

George R. Aiken, PhD

USGS National Research Program
Boulder, CO

Kevin J. Cunningham, PhD

USGS
Fort Lauderdale, FL

Introduction

Groundwater resources are the major sources for potable and irrigation waters in Florida. As the population of Florida continues to increase, especially in the Miami-Dade County region, the demand for adequate and high quality groundwater resources increase as well. These increases in demand have forced municipalities to extract groundwater from more than one aquifer. This situation is most evident in the Miami-Dade County area where groundwater for potable use is extracted from the Floridan and Biscayne aquifers and blended prior to treatment and distribution.

The quality groundwater in the Floridan and Biscayne aquifers can be degraded by several processes that include, but not limited to, non-point source introduction of untreated surface waters, mechanical penetration of confining layers or injection processes such as aquifer storage and recovery (ASR). Regardless of the mechanism through which non-native waters are introduced into these aquifers or the mixing of two previously isolated aquifers, the influence this mixing has on the geochemical equilibria and microbial communities can be dramatic. Changes in the microbial community will drive alterations in the geochemical equilibria and the most significant nutrient component that microbial communities respond to is dissolved organic carbon (DOC). Also, when waters from two aquifers (e.g., Floridan and Biscayne aquifer) having significantly different geochemical and nutrient characteristics are blended for potable use, the efficacy of chemical disinfectants and UV-disinfection and the potentials for biofilm and disinfection bioproduct formation can be significantly altered, depending on the mixing ratio.

Our study first proposes to compare survival, transport potential, activities, and community structure of microbial communities in two aquifers that are currently used as sources of drinking water, i.e., the Floridan and Biscayne aquifers. The relationship of the aforementioned differences will be related to differences in the character of the groundwater chemistry and the limestone. We then propose to examine the effects of changes resulting from blending of the aforementioned two sources of water upon the efficacy of UV disinfection and the potentials for disinfection byproduct and biofilm formation. Finally, we propose to examine the differences in the character of the organic carbon in the Floridan and Biscayne Aquifers as well as in surface water that may be used for ASR purposes. We would then examine the potential effect that changes in the amount and character of organic carbon that could occur during ASR cycles would have upon the transport, attachment, and survival behaviors of indigenous and introduced bacteria in the Floridan aquifer.

Research Tasks (not listed in order of significance or preference)

- 1. Survival and persistence of indicator bacteria and pathogens using diffusion chambers.** A proof of concept approach will be used to demonstrate that the USGS diffusion chamber design can withstand the conditions within designated aquifers for extended periods of time. Fluorescent beads will be used in the initial phase, labeled native bacteria in the second phase and, if permitted, laboratory grown microbial indicators (i.e., total coliforms, fecal coliforms, *E. coli*, enterococci, bacteriophage).
- 2. Quantification and characterization of DOC and its potential to form disinfection bioproducts.** The objectives of this task are to (a) define the nature and reactivity of DOC in the Floridan and Biscayne aquifers and a nearby source of surface water and (b)

monitor changes in the composition and reactivity of the DOC as a function of mixing source waters and/or injection of treated water into native groundwater as part of an ASR project. The distributions of organic carbon will provide "fingerprints" of dissolved organic matter (DOM) in the respective systems and provide information about how various processes alter the "fingerprints". In addition to the DOC/DOM analyses 24 hr total trihalomethane (TTHM) formation potentials will also be performed.

Bacterial indicator fate and transport experiments (Tasks 1 and 4) will require purified DOC/DOM from the native and mixed waters. Large volumes of the respective water sources will be processed to recover and quantify the DOC/DOM which will be subsequently characterized for elemental composition, ^{13}C -NMR and molecular weight.

3. **Characterization of solid aquifer material.** Digital borehole images, borehole flowmeter and fluid conductivity and temperature measurements, preexisting information on hydraulic tests, along with rock cores and cuttings samples will be form the principal data base for identifying the spatial distribution of productive parts of the aquifer from where groundwater is produced in pumping wells and where mixing of waters occurs during cycle testing. This task will use scanning electron microscopy, X-ray diffraction, electron probe, and petrographic microanalyses to characterize chemistry/mineralogy of aquifer rock matrix and permeable flow passageways. These analyses will provide information on potential source and distribution of minerals (including grain and fracture coatings) and redox active surfaces on the Floridan and Biscayne aquifer core samples and delineate relation of these minerals to cyclic vertical changes in stratigraphy.
4. **Effect of the alterations in DOC upon microbial activity and transport.** USGS diffusion chambers will be used to retain fragmented core material obtained from the respective aquifers. These chambers will be lowered into the Floridan and Biscayne aquifers to specified depths and left for extended periods of time to allow colonization of the material by native bacteria. Once the chambers are retrieved the colonized aquifer material will be used in laboratory experiments to assess the changes in native bacterial activity and diversity we can expect in response to differences in amounts and reactivity of DOC recovered from the different water sources. In a separate set of experiments, the effect of differing amounts and reactivity of native DOC upon the transport potential of selected pathogens through limestone core samples will be examined using modified triaxial cells.
5. **UV disinfection and microbial reactivation rates.** Laboratory-based experiments will be designed to expose microbial populations in native, blended and injected waters with UV light at treatment relevant doses. Microbial populations will include the native bacteria in the respective samples and laboratory grown indicators and pathogens will be seeded into the respective water types. Recovery and culturing methods will follow those described in the relevant regulations for monitoring the microbiological quality of these types of water. These experiments will also include an extended "dark recovery" period in each incubation period that will quantify the rates of UV damage recovery for the respective indicators and pathogens.

6. **Bacterial productivity, respiration, physiological activity, diversity.** Samples from the respective experimental designs listed above will be processed to quantify the number of bacteria by using DNA-specific fluorescent stains and epifluorescence microscopy, productivity and respiration rates using radioisotopic methods, respiration rates using a fiber optic oxygen probe and community level physiological profiles using Biolog EcoPlates. Bacterial community diversity and changes in that diversity will be determined using PCR and denaturing gradient gel electrophoresis (DGGE). These data will be used to assess how changes in DOC/DOM from blending and injection waters alter bacterial physiology and diversity at the community level.

Budget projection

Labor	\$233850.00
Analytical analyses	92,400.00
Equipment & expendables	<u>44,400.00</u>
Total	\$370,650.00